Does Economic Integration Stimulate Capital Mobility? An Analysis of Four Regional Economic Communities in Africa

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Abstract

It is well known that high levels of regional integration enable portfolio risk diversification and capital mobility. While there have been a number of empirical attempts to verify the presence of capital mobility using the Feldstein-Horioka (FH) approach, none of them to the best of our knowledge have explicitly examined capital mobility changes across regional economic groupings rather than individual countries in Africa, and analyzed sub-samples to compare effects of pre-versus post integration. Filling this gap in the literature, this paper analyzes how some major regional economic integration initiatives, such as SACU (South African Customs Union), UEMOA (West African Economic and Monetary Union), COMESA (Common Market for Eastern and Southern Africa) and ECOWAS (Economic Community of West African States)) have influenced capital mobility in their member countries. To estimate the investment and savings relationship, we use Pedroni's (2004) fully modified ordinary least squares (FMOLS) panel cointegration method, applying to a sample of 25 African countries for which annual data is available from 1960-2009. To assess robustness of our results, we also employ the fixed effects, random effects and Mark and Sul's (2003) dynamic OLS (DOLS) methods. Our findings suggest that international capital mobility has only slightly increased in the African countries due to these agreements.

Keywords: Regional economic integration; Feldstein-Horioka puzzle; Cointegration; International capital mobility

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1. Introduction

It is well known that high levels of regional integration enable portfolio risk diversification and capital mobility. Capital mobility offers useful insights for single currency debates, tax policies on capital and saving, whether growth is constrained by domestic saving and for the crowding effects of fiscal deficits. If capital mobility is found to be high then it is probable that countries cannot pursue independent monetary policies. In the context of advanced countries, a number of studies show strong relationship between regional integration and capital mobility, including Molle (1990) and Pelkmans (1997). However, such studies have been lacking for the African countries, in spite of several initiatives towards regional economic integration involving them.

Notably, in May 1994, the African Economic Community (AEC) was established as an initiative to promote economic integration in Africa. The AEC was aimed at bringing in all existing regional economic groupings in Africa to eventually create a large single market for Africa, with the ultimate aim of creation of an economic union on the lines of the European Union (EU). COMESA (Common Market for Eastern and Southern Africa), ECOWAS (Economic Community of West African States), SADC (Southern African Development Community) and EAC (East African Community) form the major pillars of the AEC. In line with this objective, the Africa Free Trade Zone (AFTZ) was announced at the EAC-SADC-COMESA Summit on Wednesday October 22, 2008 by the heads of SADC, COMESA and EAC (consisting of 26 countries with a combined GDP of nearly US $ 624 billion). All this is expected to foster stronger integration among existing regional blocs in Africa and stimulate capital mobility.

The rationale for regional economic integration in developing countries is implicit. Asante (1997) argued that regional integration is a tool for industrial growth and development. Hoekman, Schiff and Winters (1998) and Mathews (2003) pointed out a number of benefits in pursuing integration: investment and output growth effects, reduced regulatory barriers, economies of scale and emergence of intra-industry trade. Mattoo and Fink (2002) argued that there could be regulatory gains from regional integration. They proposed the concept of an optimum harmonization area composed of the set of countries for which aggregate welfare would be maximized. Jenkins (2001) provides evidence from the Southern African region that poorer members catch up with (converge on) richer ones through the process of trade. Johnson (1995), Lyakurwa *et. al* (1997) and Foroutan and Prichett (1993) found that all the regional economic agreements in Africa have been less successful in achieving their objectives. Foroutan (1993) argued that a common reason for the

failure of regional integration in Africa is that removal of trade barriers may cause the few industries to migrate to industrially more advanced countries; see also Page (2000).

This paper contributes to the existing literature on regional integration and capital mobility by analyzing the changes in savings-investment relationship affecting capital mobility across four regional economic communities (SACU[1], UEMOA[2], COMESA and ECOWAS) in Africa, and using sub-samples to compare effects of pre-versus post regional economic integration. The framework used to determine capital mobility in these regional economic communities is the Feldstein and Horioka (1980) puzzle. The empirical methodology utilized is the Pedroni's (2004) fully modified ordinary least squares (FMOLS) panel cointegration method. To assess robustness of our results, we also employ the fixed effects (FE), random effects (RE) and Mark and Sul's (2003) dynamic OLS (DOLS) methods. These methods are applied to a sample of 25 African countries for which annual data is available from 1960-2009.

The remainder of the paper is structured as follows. Section 2 provides a brief review of the literature and its evolution. Section 3 present the empirical results, focusing on how various regional economic integration initiatives have influenced capital mobility in Africa. Section 4 concludes the paper.

2. Literature Review

The debate over whether saving-investment co-movements are informative about capital mobility is yet unresolved. Feldstein and Horioka (1980) (FH, henceforth) postulated that under perfect capital mobility, national savings and domestic investment would be largely *uncorrelated* or saving-investment coefficient to approach zero, as implied in a world of perfect capital mobility. This rests on the *conventional wisdom* that domestic saving must flow to finance the most attractive investment projects and as such should not be correlated with domestic investment.[3] However, FH observed empirically that, contrary to the

[1] SACU members are also members of the SADC. SADC's original members were the SACU members followed by Mauritius, Zimbabwe, and Madagascar. In 2008 Malawi, Mozambique, Tanzania, and Zambia joined, but Madagscar's membership has now been suspended due to political reasons.

[2] UEMOA (Union économique et monétaire ouest-africaine) is a customs union and currency union between the members of ECOWAS.

[3] However, for this to exist, three separate conditions must hold as set out in the article of Dooley, Frankel and Mathieson (1987). Firstly, a country's investment rate should depend solely on domestic interest rates. Secondly, domestic interest rates would have to converge to a world norm, and thirdly, there should be no difference between countries regarding the expected return on investment and saving. If any of the conditions

predictions of perfect capital mobility theory, there exists a strong and statistically significant correlation between domestic savings and domestic investment (a high "savings retention coefficient") when the relationship was tested for cross section data of 16 OECD countries using 5 years-average data covering the time period, 1960-1974. Such evidence was partially attributed to differences in structural factors such as information bias, investor's behaviour in taking risks, differences in legal framework and policy environment. FH estimated the following version where $ITY =$ ratio of investment to income, $STY =$ ratio of saving to income, $\beta =$ saving retention coefficient, i and t are country and time subscripts and $\varepsilon_{it} \sim N(0, \sigma)$ for all i and t.

$$ITY_{it} = \alpha_i + \beta_i STY_{it} + \varepsilon_{it} \quad (1)$$

The literature on this subject has ever since evolved, testing the FH hypothesis using three main approaches: First, by investigating the correlation between saving and investment to determine the degree of international capital mobility (Penati & Doley, 1984, Dooley *et. al* 1987, Agbestsiafa , 2002 ; Sinha & Sinha, 2004); or through examining the rate of return data since real interest rate parity (RIP) is implicitly assumed in the FH approach[4]. For RIP to hold requires not only perfect capital mobility but also the integration of goods markets and efficiency of exchange markets[5]; or through analyzing net real resources transfer over time using consumption smoothening approach (where it follows that in a world of integrated capital markets, consumption risks can be traded to improve welfare)[6]. Second, by examining the current account identity, regressing change in current account balance rate on the change in investment rate (studies such as Sachs, 1981; Summers, 1988; Coakley et. al 1998, Obstfeld, 1986); and finally by analysing the endogenous policy response such as the impact

does not hold, a strong relationship between saving and investment do not necessarily violate the assumptions of a perfectly integrated capital market.

[4] Obstfeld & Rogoff (2000) found that capital mobility has been rising with the rate of return showing an upward trend.

[5] Following Frankel's (1991) decomposition of RIP into two components: r-r^* = (i-i^*-fd)(fd-DPe- DPe*). The first right bracket term refers to covered interest parity which captures all barriers (such as transaction costs, information costs, capital controls, and various taxes) to integration of financial markets across national boundaries. The second bracket term refers to the 'currency premium'. Frankel argues that a currency premium exists due to real and nominal exchange rate variability. Therefore, even with equalization of covered interest rates (i-i^*-fd = 0), large differentials in real interest rates may persist due to volatility in both components of the currency premium

[6] See Ghosh(1995) and Ghosh and Ostry (1995).

of macroeconomic policies, institutions, other structural factors (Ozmen & parmaksiz, 2003; Ozmen, 2005). Most of the studies validate the FH findings suggesting low capital mobility and some of the explanations to this unresolved puzzle ascribes to factors such as differences in policy environment, information & technology, demography etc.

OECD related Studies

The majority of empirical studies undertaken for OECD countries documented a remarkably robust correlation between saving and investment rates using different specification and estimation techniques[7] (see Appendix 1). Some of the explanations for such high correlation owes to the current account targeting by government expenditures even in the presence of capital mobility (Artis and Bayoumi, 1991) or linked to the existence of a home bias due to high transaction costs associated with foreign markets , thereby reducing the international diversification of portfolios (Georgopoulos and Hejazi, 2005).

On the contrary, several studies (Sachs, 1980, 1981; Asimakopoulos, 1983) argued that investment was more correlated with current account flows for OECD economies than with the savings, post 1960 period[8]. Kool and Keijzer (2009) observed decrease in saving-investment relations corresponds with increasing economic and financial integration[9] thereby highlighting the importance of better informational and institutional links in stimulating capital mobility. Using the data for 13 OECD countries during 1960-2007, Rao *et. al.* (2010) found that there has been a significant improvement in international capital mobility between the OECD countries during the post-Bretton Woods period.

[7] However, the evidence of strong F-H results faces some criticisms on the following grounds: (i) large industrialized countries in the sample that seems to exert an upward bias on the estimated coefficients (see Sachs, 1983; Murphy, 1984; Tesar, 1991; Ho and Chiu, 2001; Georgopoulos and Hejazi 2005 etc). (ii) omission of variables' affecting the results due to endogeneity bias and consequently misspecifying the estimation technique adopted as an appropriate methodology for studying the relevant relationship (see Obstfeld, 1986; Roubini 1988; Finn, 1990; Baxter and Crucini, 1993; Corbin, 2001 etc). (iii) Definition and the measurement problems that occur related to variables used under study, for example, taking gross rather than net figures of savings and investment. Studies such as Rossini & Zanghieri (2003) used definition of investment that excludes foreign direct investment. Further net investment figures used as a proxy for investment has been criticized for being inaccurately depreciated (see Feldstein, 1983; Tesar, 1991, 1993) or some studies questioned the saving and investment data for OECD countries as they found it to be inaccurate (see Obstfeld, 1986, Baxter and Crucini, 1993).

[8] Sachs (1981) found that 65% of the change in investment during the period was financed by capital inflows rather than by savings, suggesting the evidence of higher capital mobility for 15 industrialized countries.

[9] They found 9 member countries of EU experienced a sharp decline in the S-I relation compared to other 14 (non-EU) countries during 1980s.

The common consensus emerging out of the existing literature points to the fact that such correlation is not as strong as the original FH results confirmed[10]. In this context, the study by Apergis and Tsoumas (2009) offered the most updated survey on this subject, compartmentalizing theoretical and empirical approaches separately. They concluded that most of the empirical studies tend to reject the original strong result of FH but lend support to a much weaker form of correlation that exists between saving and investment.

Studies on Developing countries (other than Africa)

In contrast to OECD specific studies, there is far less evidence for a close relationship between saving and investment for other countries such as less developed countries or developing countries including East Asia[11] (see Appendix 2). By and large, results of the above studies indicate that the degree of capital mobility is higher for developing economies, giving support to factors such as the magnitude of foreign aid (Dooley et. al, 1987; Isaksson, 2001; Vamvakidis and Wacziarg, 1998), the degree of openness, the size of the non-traded sector (Wong, 1990), and the differences in the financial structure of each country (Kasuga, 2004).

Studies on African countries

Among the existing studies, Payne and Kumazawa (2005) was the first one to use pooled OLS, FE and RE methods on 29 Sub-Saharan African countries, over the period 1980-2001. They found that savings coefficients are low as documented by previous studies on developing economies and that there has been a gradual increase in capital mobility over time. This was attributed to openness to international trade and foreign aid that played a positive impact on investment. Further, the study noted that inclusion of country-specific effects via the FE and RE models result in savings retention estimates, ranging between 0.209 and 0.243 and are statistically significant at the 1 percent level. The authors concluded that heterogeneity in the sample rationalizes for using FE as the ideal model for estimation[12].

[10] See Feldstein, 1983; Feldstein & Bachetts, 1991; Penati & Dooley, 1984; Obstfeld, 1986; Tesar, 1991; Artis & Bayoumi, 1991; Coakley *et. al*, 1995, 1996 and 2001; Taylor 1996; Obstfeld & Rogoff, 2000; Katsimi and Moutos, 2007; Georgopoulos and Hejaji (2005); Fouqau, 2008; Rao et. al,. 2010, Kumar and Rao (2011); Abbott and De Vita, 2003).

[11] Dolley *et.al*, 1987, Wong 1990; Mamingi, 1994, 1997; Vamvakidis and Wacziarg 1998; Coakley *et al*.1999; Kasuga 2004 and Payne and Kumazawa, 2005).

[12] Their study did not analyze the effect of regional economic integration on capital mobility and included many countries that are not formally involved in economic integration, such as Central African Republic and Sao

A similar study by De Wet and Van Eyden (2005) also used the FE and RE methods to examine this relationship in 36 Sub-Saharan African countries over the period, 1980- 2000. The empirical evidence supported the presence of capital mobility in Africa, and noted that South Africa had a pivotal role to play in the region given its market attractiveness owing to its size and also being a rapidly growing economy. This study also included current account balance, foreign aid and openness as additional variables in the regression to test the effects of foreign aid on saving behaviour in these countries[13]. Their estimated savings retention coefficient was found to be between 0.286 (using the pooled data) and 0.349 (using the fixed effects).

Adedeji and Thornton (2006) contributed further to the understanding of the empirical literature on capital mobility and FH puzzle in Africa by applying panel cointegration techniques to data for six African countries over 1970-2000[14]. Their main finding was that capital was relatively mobile in these six African countries from 1970 to 2000, with estimated savings retention ratios of 0.73 (FMOLS), 0.45 (DOLS), 0.51 (DOLS with heterogeneity), and 0.39 (DOLS with cross-sectional dependence effects). They concluded that savings and investment in this sample were nonstationary and cointegrated using standard panel cointegration tests. They also observed a drop in the savings–retention ratios between 1970–85 and 1986–2000, which was interpreted as increased capital mobility due to impact of outward-orientated economic reforms over the period. The study argued that capital mobility has improved due to structural reform process after 1985 after which these countries reduced trade restrictions and encouraged capital flows, by undertaking regional economic integration and partially liberalizing their exchange rate regimes and financial systems. This study was therefore indicative of the fact that regional economic integration involving lowering of trade barriers could have spurred capital mobility in these countries.

Cooray and Sinha (2007) tested the relationship between saving & investment rates for 20 African countries, employing both conventional Johansen conintegration tests and much recently used fractional cointegration tests. Both tests provided mixed results. Johansen cointegration tests confirm the presence of capital mobility for 18 African countries except

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Tome and Principe. Moreover, their sample did not cover South Africa, one of the bigger and rapidly growing developing countries in Africa.

[13] This study also included a South African interactive dummy by multiplying the saving rate of each Sub-Saharan African country by a South African dummy variable to analyze whether South Africa had a different level of capital mobility and saving behaviour than the rest of the Sub-Saharan African region, therefore tending to bias the saving rate coefficient of the rest of the countries upwards, if not accounted for properly.

[14] These countries were Cameroon, Gabon, Ghana, Nigeria, South Africa and Zimbabwe.

for Rwanda and South Africa, where domestic investment was primarily financed by domestic savings instead of foreign savings. However, significant variations in the results were found using fractional cointegration. Some evidence of capital mobility was found only in case of 4 countries, such as Cote d' Ivoire, Kenya, Lesotho and Sierra Leone, while the results for Ethiopia, Malawi, Mauritius and Nigeria were mixed. However, this study does not examine the impact of regional economic cooperation by dividing the sample into pre versus post integration period.

In contrast to the above studies, Agbetsiafa (2002) lend support to the FH result that long term capital is not mobile internationally for all 6 countries, namely, Ghana, Ivory Coast, Kenya, Nigeria, South Africa, and Zambia, using cointegration and country-specific time series data analysis undertaken over 1960-1998. Furthermore, causality test indicates a unidirectional causality from saving to investment in all these economies except for South Africa having a bi-directional causality. Such results bear important policy implications, especially for these and other small open economies where increases in domestic saving will not necessarily translate into higher domestic investment under perfect capital mobility thesis.

Esso and Keho (2010) made a valuable contribution by studying saving and investment relationship for member countries of the West African Economic and Monetary Union (UEMOA) using cointegration and causality tests in time-series settings. It was found that out of seven UEMOA member countries, 3 countries namely, Benin, Cote d' Ivoire and Niger, characterized by some degrees of market imperfections, mainly related to political risk (Cote d' Ivoire), human capital (Niger) and infrastructure (Benin) have witnessed low capital mobility. Thus to facilitate international capital mobility, removing such impediments would be critical.

Bangake and Eggoh (2010) categorized African countries into specific groups based on analyzing the effects of capital mobility due to membership in a monetary union (the West African or Central African CFA Franc zone), being an oil exporter or having a common or civil law. This study analyzed a sample of 37 African countries over 1970-2006, thus involving the longest time period of analysis compared to previous studies and the largest

sample so far[15], but did not take into account the membership of African countries in regional economic groupings during this period.

Cyrille (2010) has exclusively drawn upon a sample of 15 Sub-Saharan African countries over 1080-2004 to test FH hypothesis accounting for correlation between inward and outward capital flows. Using cross sectional, panel data and time series analysis, the results confirmed the earlier findings in case of developing countries. It was noted the downward movement in the saving-investment coefficient in case of developing countries was more due to the omission of some factors (foreign aid and trade openness) instead of market flows. It was further recommended that policymakers in Sub-Sahara Africa should put more emphasis in creating and developing efficient financial market which tends to favor portfolio diversification.

Padawassou (2012) examined the validity of the FH puzzle for 22 African countries belonging to low & middle income countries. The time span covers a minimum of 28 years to a maximum of 40 years given by data availability. Using time series along with the dynamic heterogeneous panel approach, his study found significant cross-country heterogeneity and empirical findings reveal the existence of both lower and higher degree of capital mobility at the same time, thereby challenging the results of FH on developing countries.

It is notable that none of the studies in the existing literature have attempted to analyse if the major regional economic communities (such as the UEMOA, SACU, COMESA and ECOWAS) has indeed facilitated capital mobility. Our paper fills this gap in the literature.

3. Empirical Results

Data

Our sample consists of 25 African countries for which annual data are available from 1960-2009. These are Benin, Botswana, Burkina Faso, Burundi, Congo, Côte d'Ivoire, Egypt, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Niger, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Togo, Uganda, Zimbabwe and Zambia.

Table 1 provide specific details on each of these agreements. The former two agreements include a large number of African countries while the latter two are relatively small. The data on *ITY* (gross domestic investment as a share of GDP) and *STY* (gross

[15] Using the FMOLS, DOLS and pooled mean group (PMG) estimator from Pesaran et.al (1999), the authors conclude that the savings retention coefficients are 0.38, 0.58, and 0.36, respectively.

domestic savings as a share of GDP) is obtained from the World Development Indicators (WDI 2010) and International Financial Statistics (IFS 2010).

Table 1: Selected Regional Integration Initiatives in Africa

Name of grouping/treaty	Member countries	Year of formation	Purpose/ Remarks
Common Market for Eastern and South Africa (COMESA)	Mauritius*, Burundi, Comoros*, Congo, Rwanda, Djibouti*, Libya*, Seychelles*, Egypt, South Sudan*, Sudan, Eritrea*, Swaziland, Ethiopia*, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe	1994	Aimed to enhance free trade; Lesotho and Mozambique quit in 1997 while Namibia and Tanzania withdrew in 2004 and 2000; Angola suspended membership in 2007
Economic Community of West African States (ECOWAS)	Benin, Guinea*, Niger, Burkina Faso, Guinea-Bissau*, Nigeria*, Cape Verde*, Liberia*, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana	1975	Promote economic integration; Mauritania withdrew in 2000
West African Economic and Monetary Union (UEMOA)	Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal, Togo and Guinea-Bissau*	1994	Aimed to promote common monetary zone, customs union and common external tariff
South African Customs Union (SACU)	South Africa, Botswana, Lesotho, Swaziland and Namibia*	1970	Promote customs union

Note: * indicates the countries that we excluded due to data unavailability.

Panel Unit Root Tests

To assess the time series properties of the data, we performed panel unit root tests of the variables (*ITY* and *STY*) included in the FH puzzle. Hadri (2000) is a residual-based lagrange multiplier (*LM*) first generation panel unit root test. The null hypothesis of stationarity in all panel units is tested against the alternative hypothesis of a unit root in all cross-section units. In contrast, Pesaran (2005) proposed a second generation panel unit root test in which the null of nonstationarity is tested against the alternative of stationarity. These tests are less restrictive and more powerful compared to the tests developed by Levin, Lin and Chu (2002) and Breitung (2000), which doesn't allow for heterogeneity in the autoregressive coefficient. An innovative feature of Pesaran (2005) test is that it allows for cross-sectional dependence (CSD) in the errors. The panel unit root test results for *ITY* and *STY* are given below in Table 2.

Both tests explicitly indicate that *ITY* and *STY* are I(1) in their levels. The Pesaran test in which the null is that the variable is non-stationary is not rejected at the 5% statistical level. In the Hadri test the null is that the variable is stationary and it is also rejected at the 5% statistical level. Both the tests show that the first differences of *ITY* and *STY* are stationary.

Table 2: Panel Unit Root Tests 1960-2009

Series	Pesaran	Hadri
ITY	-0.273	5.820
	(0.31)	(0.00)*
STY	-1.647	9.023
	(0.16)	(0.00)*
Δ *ITY*	-16.576	1.159
	(0.00)*	(0.27)
Δ *STY*	-21.043	2.044
	(0.00)*	(0.48)

NB: Probability values are reported in the parentheses. * denotes the rejection of the null at the 5% level

Panel Cointegration Tests and Estimates

The Pedroni (2004) panel cointegration tests could be used to investigate whether the variables (*ITY* and *STY*) are cointegrated in the panel under investigation, given the existence of heterogeneity in the panels. This method allows consistent and efficient estimation of cointegration vector and also addresses the problem of non-stationary regressors, as well as the problem of simultaneity biases. Pedroni (2000) suggests a FMOLS estimator which is simply the average of the individual FMOLS for each country. The technique therefore deals with the endogeniety of the regressors and corrects for serial correlation. The FMOLS estimator depends on the between-dimension estimation which allows for heterogeneity of the cointegrating vectors in that it presents a common cointegrating vector under the null hypothesis while under the alternative the cointegrating vector need not be common.

The null hypothesis of no cointegration is tested against the alternative of cointegration using the seven test statistics, which consist of four panel (panel ν–statistic, panel ρ-statistic, panel *pp*-statistic and panel ADF-statistic) and three group statistics (group ρ-statistic, group *pp*-statistic and group ADF-statistic). The four (three) panel (group) tests are so called the 'within dimension' ('between dimension') tests. The 'within dimension' tests take into account common time factors, while the 'between dimension' tests utilizes the group mean cointegration approach. These tests allow for heterogeneity of parameters across countries.

Table 3 report the results of the panel cointegration tests and estimates of the panel cointegrating equations. In the equations with common time dummies (trends), the majority of the cointegration tests show that there is cointegration between *ITY* and *STY* at the 5% significance level. With the exception of UEMOA, majority of the test statistics in without common time dummies versions also reject the null of no cointegration at the conventional levels. It is well known that the two *ADF* tests have more power against the null and both

reject the null of no cointegration in both models (with and without common time trends). Based on these results, we infer that *ITY* and *STY* are cointegrated and an equilibrium long run relationship exists between investment and savings. Further, the Pedroni FMOLS estimates of β is around 0.7 in COMESA and ECOWAS, while around 0.8 in SACU and UEMOA samples. These savings retention estimates are statistically significant at the 5% level.

Table 3: Panel Cointegration Tests and Estimates 1960-2009

Test statistic/ Savings estimate (β)	COMESA		ECOWAS		SACU		UEMOA	
	Time Dummies Included	No Time Dummies	Time Dummies Included	No Time Dummies	Time Dummies Included	No Time Dummies	Time Dummies Included	No Time Dummies
Panel ν statistic	-3.078*	-2.906*	-4.821*	-2.022*	-1.013	-1.264	-3.501*	-1.439
Panel σ statistic	-1.730**	-1.419	-1.690**	-5.118*	0.978	1.430	-1.276	-0.890
Panel $\rho\rho$ statistic	-4.121*	-2.105*	-2.398*	-1.754**	-1.794**	-2.011*	-1.488	-1.724**
Panel ADF statistic	-2.557*	-1.732**	-5.300*	-3.691*	-1.680**	-1.752**	-1.802**	-2.300*
Group σ statistic	-0.809	-1.260	-1.822*	-2.427*	-1.325	-1.670**	-2.281*	-1.176
Group $\rho\rho$ statistic	-2.627*	-4.742*	-3.715*	-1.690**	-2.319*	-1.043	-0.832	-1.381
Group ADF statistic	-4.512*	-2.245*	-2.364*	-3.538*	-1.841**	-1.695**	-2.047*	-1.667**
β	0.729 (9.27)*	0.696 (11.21)*	0.760 (8.39)*	0.725 (10.90)*	0.801 (5.42)*	0.844 (5.48)*	0.815 (12.08)*	0.826 (9.74)*

NB: The test statistics are distributed as $N(0,1)$. * and ** denotes significance, respectively, at 5% and 10% levels. FMOLS estimates of β is reported where *ITY* is the dependent variable. The t-ratios are in the parentheses. COMESA countries = Burundi, Congo, Rwanda, Egypt, Sudan, Swaziland, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. ECOWAS countries = Benin, Niger, Burkina Faso, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana. UEMOA countries = Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. SACU countries = South Africa, Botswana, Lesotho and Swaziland.

Effects of Regional Economic Integrations

In what follows, we shall investigate the effects of four crucial agreements which could have contributed to increased capital mobility viz., COMESA, ECOWAS, SACU and UEMOA agreements. COMESA was formed in 1994, replacing a Preferential Trade Area which had existed since 1981. ECOWAS is a regional group of fifteen West African countries, founded in 1975, with the signing of the Treaty of Lagos. SACU and UEMOA

were launched in 1969[16] and 1994 and their mission is to promote economic integration. To show the impacts of these international agreements, we construct sub-samples as follows: COMESA (pre-integration 1960-1993 and post-integration 1994-2009), ECOWAS (pre-integration 1960-1992 and post-integration 1993-2009), SACU (pre-integration 1960-1969 and post-integration 1970-2009) and UEMOA (pre-integration 1960-1974 and post-integration 1975-2009). We estimate the saving retention coefficient for above sub-samples.

Prior to further discussion, it would be useful to take an overview of what is expected from these sub-sample estimates. Most importantly, we are investigating some evidence on whether the above agreements had any significant effects on the validity of FH puzzle and capital mobility. If they have been effective, it is to be expected that the value of saving retention estimate will decline in the second set of sub-samples to show an increase in the capital mobility. The results of the cointegration tests are not reported to conserve space but we discuss them briefly here. The Pedroni cointegration tests for sub-samples indicate that there exists cointegration between ITY and STY. Majority of the test statistics reject the null of no cointegration at the conventional levels, except in UEMOA sample.[17]

Table 4 present the sub-sample estimates of β. The pre-COMESA period highlights that the estimate of β is 0.839 and 0.840, respectively, in the models with and without common time trends. In both models the estimate of β has decreased to 0.622 and 0.618, respectively, in the post-COMESA period. Similar results are also found for the ECOWAS and UEMOA samples. In these two cases, the estimate of β declined from 0.8 to 0.5. For SACU sample, the estimate of β declined only marginally, i.e. from 0.7 to 0.6. The country specific estimates of β based on the sub-sample periods are not reported but available from the authors upon request. These results show that for majority of the African countries, the estimate of β has slightly declined in the post-integration period, thus implying that international mobility of capital has marginally increased in these countries.

One of the reasons behind such low capital mobility in the presence of regional economic integration could be due to the fact that the agreements or treaties have not been properly implemented suggesting lack of political will in committing to serious integration measures as also argued by Geda and Kebret (2008). They further identify loss of revenue from tariff reduction and compensation by member countries, as well as lack of trade

[16] Note that SACU was re-launched in 1969.
[17] In UEMOA sub-samples, only three out of seven test statistics confirm that there exist cointegration between *ITY* and *STY*.

complementarities as further reasons for regional integration in Africa progressing weakly and at best unsteadily due to very low levels of intra-regional trade, as confirmed by ECA (2004) which analysed progress of regional integration in Africa using an index measure. The fact that regional economic integration measures in Africa have been unable to bring about any significant structural change in these economies[18] confirms the finding that the resultant effect on capital mobility is also expected to be almost negligible or low.

Table 4: Panel Cointegration Tests and Estimates- Subsamples

Agreements		Savings Estimate β Trend Dummies Included	Savings Estimate β Trend Dummies Not Included
COMESA	Pre-Integration 1960-1993	0.839 (14.25)*	0.840 (12.11)*
	Post-Integration 1994-2009	0.622 (12.64)*	0.618 (11.65)*
ECOWAS	Pre-Integration 1960-1992	0.768 (19.74)*	0.847 (17.84)*
	Post-Integration 1993-2009	0.540 (13.70)*	0.517 (8.35)*
SACU	Pre-Integration 1960-1969	0.746 (8.64)*	0.698 (7.56)*
	Post-Integration 1970-2009	0.623 (9.32)*	0.640 (13.93)*
UEMOA	Pre-Integration 1960-1994	0.842 (8.43)*	0.831 (13.50)*
	Post-Integration 1995-2009	0.539 (14.47)*	0.520 (11.84)*

NB: * denotes significance at 5% level. FMOLS estimates of β is reported where *ITY* is the dependent variable. The t-ratios are in the parentheses. COMESA countries = Burundi, Congo, Rwanda, Egypt, Sudan, Swaziland, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. ECOWAS countries = Benin, Niger, Burkina Faso, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana. UEMOA countries = Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. SACU countries = South Africa, Botswana, Lesotho and Swaziland.

Dominant and Overlapping Members

Membership of a regional integration arrangement is a political choice of any one country, whether based on political, social, geographic and / or economic considerations. A key characteristic of regional economic communities in Africa is the existence of dominant and overlapping members. In the case of SACU (COMESA), South Africa (Kenya) seems to be the dominant country in terms of production and trade. There is also the overlapping membership concern i.e. some countries belong to two or more regional economic communities. For the four regional economic communities we consider, it can be seen that all UEMOA countries are also members of ECOWAS. Further, Swaziland is part of SACU and COMESA. In what follows, we attempt to address the dominant and overlapping membership

[18] Also see Lyakurwa et al. (1997), Foroutan and Pritchett (1993), World Bank (1989), and Yeats (1999).

problem. In doing so, we constructed five samples, namely (i) COMESA excluding Kenya, (ii) SACU excluding South Africa, (iii) COMESA excluding Swaziland, (iv) SACU excluding Swaziland and (v) ECOWAS excluding the countries overlapping in UEMOA. Using the Pedroni's FMOLS method, we estimated these samples to ascertain the degree of international capital mobility. In addition, we estimated individual country-specific equations for all dominant and overlapping countries (Benin, Burkina Faso, Côte d'Ivoire, Kenya, Mali, Niger, Senegal, South Africa, Swaziland and Togo) using the Phillip and Hansen's (1990) FMOLS method. This is a univariate time series method that deals with the problem of second-order asymptotic bias arising from serial correlation and endogeneity and it is asymptotically equivalent and efficient (see Saikkonen, 1991).

Table 5: Estimates After Excluding the Dominant and Overlapping Countries

Agreements	Samples	Pedroni's FMOLS Savings Estimate β
COMESA excluding Kenya	Full Sample 1960-2009	0.732 (6.75)*
	Pre-Integration 1960-1993	0.831 (4.29)*
	Post-Integration 1994-2009	0.634 (4.98)*
COMESA excluding Swaziland	Full Sample 1960-2009	0.728 (9.12)*
	Pre-Integration 1960-1993	0.780 (5.71)*
	Post-Integration 1994-2009	0.602 (8.04)*
SACU excluding South Africa	Full Sample 1960-2009	0.846 (12.31)*
	Pre-Integration 1960-1969	0.750 (2.57)*
	Post-Integration 1970-2009	0.728 (2.10)*
SACU excluding Swaziland	Full Sample 1960-2009	0.828 (9.17)*
	Pre-Integration 1960-1969	0.723 (7.70)*
	Post-Integration 1970-2009	0.610 (8.92)*
ECOWAS excluding the countries overlapping in UEMOA	Full Sample 1960-2009	0.742 (5.40)*
	Pre-Integration 1960-1992	0.730 (3.11)*
	Post-Integration 1993-2009	0.529 (2.94)*

NB: * denotes significance at 5% level. *ITY* is the dependent variable in each estimated equation. The t-ratios are in the parentheses. COMESA excluding Kenya = Burundi, Congo, Rwanda, Egypt, Sudan, Swaziland, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. COMESA excluding Swaziland = Burundi, Congo, Rwanda, Egypt, Kenya, Sudan, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. ECOWAS excluding countries overlapping in UEMOA = Sierra Leone, Gambia and Ghana. UEMOA countries = Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. SACU excluding South Africa = Botswana, Lesotho and Swaziland. SACU excluding Swaziland = Botswana, Lesotho and South Africa.

Table 6: Univariate FMOLS Estimates 1960-2009

	BEN	BFA	CIV	KEN	MLI	NER	SEN	ZAF	SWZ	TGO
β	0.741 (4.30)*	0.722 (3.11)*	0.824 (2.08)*	0.695 (4.26)*	0.810 (1.78)**	0.769 (3.47)*	0.674 (2.88)*	0.490 (5.26)*	0.745 (1.82)**	0.781 (2.72)*

NB: BEN = Benin, BFA = Burkina Faso, CIV = Côte d'Ivoire, KEN = Kenya, MLI = Mali, NER = Niger, SEN = Senegal, ZAF = South Africa, SWZ = Swaziland and TGO = Togo. * and ** denotes significance at 5% and 10% levels, respectively. *ITY* is the dependent variable in each estimated equation. β is the saving retention coefficient. The t-ratios are in the parentheses.

Table 5 present the estimates of β after excluding the dominant and overlapping countries. Results show that the estimates of β remain fairly unchanged when we exclude

Kenya and Swaziland (Swaziland) from the COMESA (SACU) samples. Similarly, the estimates of β in ECOWAS sample after excluding the countries overlapping in UEMOA is fairly same as before. However, excluding South Africa from the SACU sample did yield some interesting results. In particular, the estimate of β in the post-integration period is not much different from the estimate in pre-integration period. This implies that the lower estimate of β (around 0.6, see Table 4) in SACU sample is attributed to the inclusion of South Africa. Table 6 present the univariate time series (FMOLS) estimates of β for individual overlapping countries.[19] It is noteworthy that South Africa has the lowest saving retention coefficient (0.49). The estimates of β in other overlapping countries are around 0.7 to 0.8. Thus, we infer that the slight increase in the international capital mobility for SACU is largely due to South Africa. It seems that overlapping membership is not a major problem in our case.

Robustness

Since the Pedroni's FMOLS technique yields slightly reduced estimates of β in the post-integration periods, it is therefore important to assess how robust are these results. To investigate the robustness of the results, we utilize three methods viz., fixed effects (FE), random effects (RE) and Mark and Sul's (2003) DOLS to estimate the *ITY* and *STY* relationship. The FE method accounts for heterogeneity across countries, i.e. unobserved variables that do not change over time. The rationale behind RE model is that, unlike the FE model, the variation across entities is assumed to be random and uncorrelated with the independent variables included in the model. The crucial distinction between FE and RE models is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model, not whether these effects are stochastic or not. Greene (2008) provides an excellent exposition of the FE and RE models. Mark and Sul's (2003) DOLS estimator allows for heterogeneity across individuals and these include individual-specific time trends, individual-specific fixed effects and time-specific effects. The estimator is entirely parametric and more precise than the single equation estimators (Mark and Sul, 2003, p.655).

[19] To avoid short sample bias, we do not estimate β for the subsamples.

Table 7: Robustness- Full Sample 1960-2009

Estimator	COMESA Savings Estimate β	ECOWAS Savings Estimate β	SACU Savings Estimate β	UEMOA Savings Estimate β
FE	0.705 (12.36)*	0.754 (6.43)*	0.790 (13.27)*	0.825 (6.31)*
RE	0.682 (5.30)*	0.795 (3.42)*	0.844 (11.53)*	0.830 (7.82)*
Mark and Sul's DOLS	0.711 (14.59)*	0.768 (8.94)*	0.815 (9.63)*	0.798 (8.50)*

NB: * denotes significance at 5% level. *ITY* is the dependent variable in each estimated equation. The t-ratios are in the parentheses. COMESA countries = Burundi, Congo, Rwanda, Egypt, Sudan, Swaziland, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. ECOWAS countries = Benin, Niger, Burkina Faso, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana. UEMOA countries = Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. SACU countries = South Africa, Botswana, Lesotho and Swaziland.

Table 8: Robustness- Subsamples

Agreements		FE Savings Estimate β	RE Savings Estimate β	Mark and Sul's DOLS Savings Estimate β
COMESA	Pre-Integration 1960-1993	0.825 (8.41)*	0.776 (3.06)*	0.795 (11.27)*
	Post-Integration 1994-2009	0.610 (7.53)*	0.638 (2.31)*	0.590 (8.60)*
ECOWAS	Pre-Integration 1960-1992	0.792 (10.65)*	0.813 (5.32)*	0.808 (11.27)*
	Post-Integration 1993-2009	0.536 (9.67)*	0.549 (4.60)*	0.537 (10.63)*
SACU	Pre-Integration 1960-1969	0.715 (5.28)*	0.740 (6.51)*	0.685 (7.34)*
	Post-Integration 1970-2009	0.640 (4.33)*	0.619 (3.19)*	0.604 (5.52)*
UEMOA	Pre-Integration 1960-1994	0.815 (15.42)*	0.784 (6.74)*	0.802 (6.20)*
	Post-Integration 1995-2009	0.527 (8.73)*	0.540 (4.14)*	0.547 (5.32)*

NB: * denotes significance at 5% level. *ITY* is the dependent variable in each estimated equation. The t-ratios are in the parentheses. COMESA countries = Burundi, Congo, Rwanda, Egypt, Sudan, Swaziland, Kenya, Uganda, Zambia, Madagascar, Malawi and Zimbabwe. ECOWAS countries = Benin, Niger, Burkina Faso, Senegal, Côte d'Ivoire, Mali, Sierra Leone, Gambia, Togo and Ghana. UEMOA countries = Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo. SACU countries = South Africa, Botswana, Lesotho and Swaziland.

Table 7 (Table 8) reports the full sample (subsample) estimates of β for the four regional economic communities. Overall, the estimates are found to be pretty robust in the different estimation methods considered. In particular, it is notable that the coefficients of β have declined slightly in the post-integration periods in all cases. These results are consistent with the Pedroni's FMOLS estimates presented in Tables 3 and 4. On the basis of these results, we argue that the international mobility of capital has marginally increased in these countries.

Moreover, we tested for the existence of CSD in our time series panels. CSD is liable to invalidate simple rules of statistical inference based on independence assumptions. The

existence of CSD is not uncommon in time series panel data and if it is not dealt with, one may get small improvement in efficiency from panel estimators relative to a single time-series. There are many sources of CSD, for instance, spatial spillovers, interaction effects through trade or integration agreements and other common unobserved factors that influence all groups. Various approaches to modelling or correcting for CSD are possible, however, in our case we used the Breusch and Pagan (1980) Lagrange Multiplier (LM) test. The rationale for using this test is because it works well when T (time dimension) > N (cross-section units).

We subjected the full sample FE estimates to Breusch-Pagan LM test and the results (LM statistics with p-values in parentheses) are as follows: COMESA = 526.37 (0.00), ECOWAS = 840.50 (0.00), SACU = 341.03 (0.00) and UEMOA = 738.17 (0.00). In all cases, the null that residuals across entities are independent is rejected at the 5% level. As our results strongly indicate the presence of common factors affecting the cross-sectional units, therefore we re-estimate the FE model and robust the standard errors by applying Driscoll and Kraay (1998) procedure. Although this improved the statistical significance (t-ratios), the estimates of β have remained fairly same. The full sample FE estimates of β with Driscoll and Kraay (1998) standard errors (t-ratios reported) are as follows: COMESA = 0.704 (12.49), ECOWAS = 0.753 (7.10), SACU = 0.790 (14.05) and UEMOA = 0.824 (6.45). We also tested for CSD for the subsamples. We find the estimates of β are consistent with the original estimates.[20]

4. Conclusion

FHP has stimulated a large number of empirical works because of its important implications. It has directly or indirectly implied that international capital mobility is low in OECD countries (Kumar and Rao, 2011). In this paper we have used the time series based panel data method (Pedroni, 2004) and data from 25 African countries to test the validity of the Feldstein-Horioka (FH) puzzle. We investigated how various integration agreements (COMESA, ECOWAS, SACU and UEMOA) have affected the capital mobility. Our findings suggest that international capital mobility has only slightly increased in the African countries due to these agreements, which would be expected given the weak implementation and slow progress of integration so far. To this end, the least influential agreement seems to be SACU.

[20] These results are not reported to conserve space.

Appendix 1
Selected Empirical Literature analysing FH puzzle in OECD Countries

Studies	**Data Set and Time Period:**	**Estimation Technique**	**Key Findings (β Estimate)**
Feldstein Horioka (1980)	1960-1974 (16 OECD Countries)	Cross-sectional regression	Lend no support for capital mobility (captured by high values of β = 0.87 to 0.91)
Bayoumi (1990)	1965-1986 (10 OECD Countries)	Cross-sectional and Time series Analysis: OLS, Two Stage Least Squares & Bootstrap regression	Low capital mobility (but reported marginal decline in β over time with financial deregulation)
Feldstein & Bachetta (1991)	1960-1986 (23 OECD Countries)	Cross-sectional regression	Lend no support for capital mobility, validating FH findings for extended time- period that includes observations from post Bretton-agreement.
Tesar (1991)	1960-1986 (24 OECD Countries)	Cross-sectional regression	Low capital mobility (validates FH results of high S-I correlation). However, higher capital mobility observed in the Post-Bretton Woods sample period.
Taylor (1996)	1850- 1992 (12 countries)	Time-series: First order ECM and cross-section analysis	Confirmed FH results of low capital mobility (with significant cross-country heterogeneity). The second period of financial globalization (since 1970s) witnessed improvement in capital mobility.
Coakley et. al. (2001)	1980-2004 (12 OECD countries)	Panel Mean Group	Supports long run capital mobility (β = 0.32) with integration of financial markets
Giannone & Lenza (2004)	1970-1999 (24 OECD Countries)	Factor Augmented Panel Regression	Higher capital mobility in international financial markets (β = 0.34)
Fouquau et. al. (2009)	1960–2000 (24 OECD countries)	Panel Smooth Transition Regression	Supports some marginal improvement in capital mobility (though results confirmed strong heterogeneity with respect to degree of capital mobility, ranging from β =0.704 to β = 0.52)
Kool and Keizer (2009)	1973-2003 (23 OECD Countries)	Cross-sectional regression Country & Panel fixed effects	Some evidence of improvement in capital mobility (associated with drop in β with increasing economic and financial integration)
Rao, et. al (2010)	1960-2007 (13 OECD countries)	Systems Generalized Method of Moments	Bretton Woods agreement more influential than Maastricht treaty in increasing international capital mobility
Kumar et. al (2010)	1960-2007 (Australia) two sub-samples: 1960-1980 and 1981-2007	GETS EG FMOLS JML	Low capital mobility (FH holds in weaker form with β slightly larger than 0.5 over the entire time period). Comparing sub-sample periods, the 1980s financial reforms improved capital mobility.

Notes: OLS = ordinary least squares, ECM = error correction model, GETS = general to specific, FMOLS = fully modified OLS and JML = Johansen maximum likelihood.

Appendix 2
Selected Empirical Literature analysing FH puzzle in Developing Countries (except Africa)

Studies	**Data Set and Time Period:**	**Estimation Technique**	**Key Findings (β Estimate)**
Dooley et. al (1987)	1960-1984 (64 countries: (48 developing & 14 OECD)	OLS	Consistent with FH findings: Low capital mobility exist for OECD countries (with high S-I correlation) compared to developing countries with higher degree of capital mobility (with low S-I correlation). The results get further strengthened during the floating exchange rate period, 1974-84 vis-à-vis fixed
Wong (1990)	1975-1981 (45 developing countries)	FMOLS	The size of non-traded sector partially explains the low S-I correlation (0.08) observed in developing economies
Mamingi (1997)	1970-1980 (58 Developing countries)	FMOLS	Those classified as middle -income seems to be more capital mobile than low-income countries.
Vamvakidis & Wacziarg (1998)	1970-1993 (103 countries: 83 Developing & 20 OECD)	Fixed effects Panel Data estimation	Supports higher capital mobility in the middle & low income countries (with greater dependence on foreign aid as foreign source of investment).
Coakley et. al (1999)	1965-1990 (20 OECD & 44 LDCs)	Cross sectional regression	Observed lower β values for LDCs but that does not corresponds to higher capital mobility but differences in policy responses.
Isaksson (2001)	1975-1995 (90 developing countries)	Cross sectional regression, OLS & Instrumental Variable Regression, Fixed & Random effects Panel regression	Lend no support for capital mobility except for Middle East countries.
Kasuga (2004)	1980-1994 (79 developing & 23 OECD countries)	OLS Instrumental Variable	The differences in financial structure accounted for high capital mobility in developing economies (with low S-I relation, β =0.04) and Low capital mobility in OECD countries with (high S-I relation, β =0.55)
Sinha and Sinha (2004)	Countries included with at least 30 years data available (123 countries)	ECM	Capital is internationally mobile only in 16 out of 101 countries, mostly characterized with lower per capita income
Payne & Kumazawa (2006)	1980-2003 (47 developing countries)	Mean Group Estimator	Observed higher capital mobility across developing countries (β =0.36)
Kim et. al (2007)	1980-2002 19 OECD countries East Asia (included 10 Asian countries)	Cross section regression & OLS Generalized Least Squares	Contrary to FH findings, observed higher capital mobility for OECD countries (β = 0.70) when compared to East Asia (β =0.88).

Notes: OLS = ordinary least squares, ECM = error correction model and FMOLS = fully modified OLS.

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